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DOCKET FILE COPY ORIGINAL

April 5, 1993

HAND DELIVER

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, DC 20554

Dear Ms. Searcy:

On behalf of Capital Cities/ABC, Inc., transmitted herewith for filing with the Commission are an original and five copies of its Comments in ET Docket No. 92-298.

If there are any questions in connection with the foregoing, please contact the undersigned.

Sincerely yours,

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's	)	ET Docket No. 92-298
Rules to Establish a Single AM	)	
Radio Stereophonic Transmitting	)	
Equipment Standard	)	

COMMENTS OF CAPITAL CITIES/ABC, INC.

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Broadcast Operations & Engineering

April 5, 1993

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules to Establish a Single AM Radio Stereophonic Transmitting Equipment Standard	)	ET Docket No. 92-298

To: The Commission

COMMENTS OF CAPITAL CITIES/ABC, INC.

Capital Cities/ABC, Inc. ("Capital Cities/ABC") submits these Comments and the attached Engineering Statement in response to the Commission's Notice of Proposed Rulemaking ("Notice"), released January 6, 1993, concerning its proposal to adopt the Motorola C-Quam system as the "single AM radio stereophonic transmitting equipment standard" for stereophonic AM broadcast radio service mandated by Congress in Section 214 of the Telecommunications Authorization Act of 1992.

Introduction

As the operator of nine AM stations in major markets, and eight radio network program services, whose affiliates include AM stations of many classes and sizes,

Capital Cities/ABC does not oppose the Commission's goal to "eliminate the remaining uncertainty with regard to the AM [stereo] technology broadcasters should employ and thereby serve to promote expansion of AM stereo transmitting equipment and a corresponding improvement in the quality of AM service." But we believe that merely designating an AM stereo standard is only a small step toward such an improvement in service quality. We agree with the Commission's evident interpretation of the Telecommunications Authorization Act: that Congress intended not merely to mandate the abstract selection of a uniform AM stereo standard, but sought to encourage the revitalization of the AM broadcast service, a long-standing goal of the Commission. See Report and Order 91-303, MM Docket No. 87-267 ("Report and Order").

Capital Cities/ABC fully supports the Commission in its efforts to solve the AM broadcast system problem in a comprehensive manner and in its proper recognition that a solution cannot be accomplished in AM transmission only, but also will require consideration of receiver performance. We wish, by these Comments, to remind the Commission that AM

overall improvement and revitalization of the AM broadcast service." The Commission recognized that the historical

Broadcasters have done their part to improve the AM system. After the Commission enacted Rule 73.44 in April 1989 -- which imposed a blend of the NRSC-1 and NRSC-2 transmission standards -- AM stations undertook the work and expense necessary to comply with the rule. The 374 AM stations inspected by the Field Operations Bureau in July 1990 were in substantial compliance with Section 73.44 standards. See Engineering Statement. As the Commission has noted, the "logical follow up" to the imposition of the NRSC transmission standard is "the adoption by the receiver manufacturers of the NRSC-3 receiver specifications, which match receiver bandwidth characteristics to those set for transmitters." Report and Order, paragraph 206.

What has happened since the Report and Order does not give one much reason for optimism that the revitalization of the AM service is being realized through improved receiver design. Only six manufacturers currently make AM receivers substantially meeting the NRSC-3 standard, and the Commission has not yet published a list of complying receivers. See attached Engineering Statement.

We are aware that NAB and EIA are working to address these issues. See Report and Order, paragraph 207. Their efforts may result -- but have not yet resulted -- in voluntary improvements in AM receivers that were not realized in response to the Report and Order. If such industry efforts remain unsuccessful, it may be necessary for the Commission

and Congress to consider mandatory AM receiver performance standards as an essential component of the Commission's program to transform and revitalize the AM broadcast service by the year 2000.

II. AM Stereo

As a general proposition, Capital Cities/ABC does not disagree with the Commission that the designation of a single AM stereo standard will eliminate market uncertainty and could ultimately improve AM service. But whatever explains the apparent market preference for the Motorola system, that fact should not be dispositive. The Commission has the responsibility to make an independent judgment that the AM stereo standard selected meets the public interest test. As set forth in detail in the attached Engineering Statement, we believe that there are serious unanswered questions concerning the quality and superiority of the Motorola system. Blanket endorsement of the Motorola system, and the requirement that all other systems be abandoned, may be ill-advised where (a) the Motorola non-linear modulation creates more high-order distortion products than linear modulation systems, such as Harris; and (b) quadature AM stereo transmissions using the Harris system can be decoded by a Motorola receiver. As also set forth in the Engineering Statement, we believe the Commission should consider adopting a "standard" -- as Congress mandated -- rather than the

particular Motorola system, to allow for the play of competitive forces to foster quality improvements.

Conclusion

For the reasons set forth above, Capital Cities/ABC urges that the Commission, before adopting the Motorola C-Quam system as the standard for AM stereo broadcasting and banning all other systems, consider the technical limitations imposed by that choice, and not lose sight of the fact that the AM stereo standard designation is only part of the substantial technical improvement necessary to revitalize the AM system.

Respectfully submitted,

By: 

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April 5, 1993

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ENGINEERING STATEMENT OF KENNETH J. BROWN
IN CONNECTION WITH
COMMENTS OF CAPITAL CITIES/ABC, INC.
AM RADIO STEREOPHONIC TRANSMITTING STANDARD

Stereo radios produced to date.

AM radio stations are capable of transmitting high quality audio, stereo notwithstanding. Indeed, many stations have been doing it for a long time. Due to certain interference problems and cost-cutting measures in designing AM radios, however, there have been extremely few AM radios manufactured since the early 1960's which are capable of receiving even some of this transmitted quality. The radios filter out all of the high-pitched (high audio frequency) sounds which are critical when listening to music. Since manufacturers recognize that stereo only has meaning where at least some high-pitched tones are present, many stereo radios have been deliberately made to receive a few more of these sounds than standard mono radios. Specifically, most monaural AM radios only have frequency response on the order of 3 kHz to the 6 dB points, comparable to a standard telephone. Most AM Stereo radios may have a little better response, to perhaps 4 kHz. For comparison, compact disc is good to 20 kHz, cassette tape to 15 or 16 kHz, FM Stereo to

Naturally, consumers do not seek what they believe to be impossible. While it may be true that quality AM radios are not in demand, the reason is that consumers are unaware that quality AM radio sound is possible. So long as people do not know that quality radios can exist, and so long as there are so few quality products on the market that people are unlikely to find them by accident, good radios are unlikely to be in demand. AM simply cannot compete against FM and tape, let alone CD, under these conditions.

When the National Radio Systems Committee first met on the AM sound quality issue, in Chicago in June 1985, the receiver manufacturer representatives present agreed to work with broadcasters to jointly seek a quality standard to match transmission and reception. Several stated freely that they would be interested in building radios to such a standard. A formal resolution to commence standards activity was adopted on September 4. The resulting standard (ANSI/EIA-549-1988, known as NRSC-1) was approved by the NRSC on January 10, 1987, and by ANSI on June 24, 1988. During its development, second adjacent channel contour overlap was determined to be a problem with transmitted emissions greater than 10 kHz from carrier, so this standard included an audio frequency cutoff provision of 10 kHz, which was a very serious compromise for broadcasters. Work was continued to develop emission limitations based on the audio frequency cutoff.

Receiver industry representatives soon began demanding mandatory broadcaster compliance with the transmission portion of NRSC-1 before they would consider making radios compliant with the wideband reception part of the standard. So the NAB asked the FCC to open a rulemaking, RM-6174, with a petition filed Nov. 6, 1987. The FCC considered NRSC-1 and the emission limitations developed in the additional committee work, which were standardized in EIA/IS-51, known as NRSC-2, which was approved April 7, 1988 by the NRSC to be effective June 1, 1988. The FCC codified Rule 73.44 April 12, 1989 (MM Docket 88-376), effective June 30, 1990, based on a blend of the transmission requirements of NRSC-1 and NRSC-2. All AM stations were then committed to expend resources to comply with the transmission standards or risk forfeitures. Indeed, the FCC's Field Operations Bureau conducted a nationwide audit in July 1990 and found all stations checked in compliance with the Rule (see Public Notice dated July 27, 1990, copy attached as Exhibit 1).

But quality receivers still did not emerge. Another NRSC standard was approved June 5, 1990, to take effect October 15, 1990, Audio Bandwidth and Distortion Recommendations for AM Broadcast Receivers (EIA/IS-80, known as NRSC-3), to define what

minimum performance standards should be expected from a decent quality AM radio. The National Association of Broadcasters began a program to identify and promote receivers which met certain criteria (the AMax criteria), which included compliance with NRSC-3.

The Commission made the next attempt to deal with the receiver quality problem, within the context of the AM proceeding, MM Docket 87-267. Capital Cities/ABC helped bring certain facts to the Commission's attention. We refer generally to the Report and Order FCC 91-303, adopted September 26, 1991, Section VIII (paragraphs 201-209), and particularly to paragraph 204 and Note 79. We also recall the comments made, at the FCC open meeting at which this Report and Order was adopted, by Mass Media Bureau Assistant Chief Hassinger and former Chairman Sikes (quotations transcribed from videotape of the meeting). Mr Hassinger commented on the "decline in fidelity of AM receivers" over the decades. Mr. Sikes said:

> A few of us have, over the last couple of weeks, been exposed to a tape that was made by an engineer in New York. He took old recordings of AM radio in the 30's, the 40's, the 50's, the 60's, and then gave us a chance to hear the comparison in the 80's and the 90's. Well, the frequency response, the fidelity, the integrity, the listenability in the 30's was much better than it is in the 90's, and I think that this institution has to take some of the blame for that fact, because technology is dramatically better today overall and yet the AM radio service is measureably, measureably inferior to what it was a number of decades ago.

Incidentally, the engineer who made that tape, Mr. Herb Squire of WQXR (now WQEW), has recently been occupied in the shift in nostalgia programming from WNEW (where it was replaced by talk) to WQEW, and the loss of the WQXR classical music

The list below has been developed by me in cooperation with NAB of radios which substantially meet NRSC-3. If the list were restricted to radios meeting the stricter AMax standard, only the DELCOs and the DENON TU-680-NAB would be listed, due to the general lack of noise blankers.

CARVER TX-11b home tuner
DELCO UX1, U1A, U1B, U1G, AND U1H auto radios
DENON TU-660 and TU-680-NAB home tuners
GE SUPERRADIO III portable radio
MARANTZ SR-52, SR-62, SR-82, and SR-92 (SR-73 available soon) home receivers
PHILIPS FR-910, FR-920, FR-930, and FR-940 home receivers

At this time, we are unaware of any other radios currently being produced which meet or approach reasonable AM quality.

It would be certainly worthwhile to publish this list, to reward the makers of good products and to show how limited the choice of acceptable quality radios really is, almost eight years after broadcasters and receiver manufacturers first met to discuss quality, and more than six years since the first quality standard was approved. It certainly is not impossible to build quality radios either, since one radio on the list, the GE SUPERRADIO III, sells "in the $50 price range" (see article and test report in Radio World, March 24, 1993, pages 1 and 3). Notably, this is NOT a stereo radio, just a good radio.

In event voluntary compliance with receiver standards does not improve in the short term, serious consideration should be given to mandatory receiver standards. The experience of KGO (AM), the most listened-to radio station in the San Francisco Bay Area, illustrates the gravity of the problem. When KGO recently completed a facility upgrade (including expensive new transmitters to accompany the state-of-the-art antenna system) and discussed it on the air, listeners called in saying so what, they couldn't hear any difference. A significant improvement in transmitted quality was measured, but no difference could be heard through the typical radio. The adoption of an AM Stereo standard will do nothing to alleviate this problem.

If regulation becomes necessary, it should require that

reproduce high audio frequencies on either AM or FM to continue as they are, but would require radios which produce decent quality FM sound to implement the NRSC/ANSI wideband standard, and radios which produce excellent FM sound to at least meet the minimum requirements of EIA/IS-80. It would be advantageous to require that receivers for which FM quality specifications are published also have AM quality specifications published, so consumers can compare products. Of course, it would also be necessary to require that FM radios larger than credit card size continue to include AM tuner sections, or manufacturers will surely cease making AM radios rather than spend money on compliance. RDS (or RBDS), now being heavily touted by the receiver industry for automatic format scanning, is only the latest offering of FM-only technology which excludes AM (after compromising with NAB to include an AM provision in the RBDS standard, no makers showing new RDS receivers appear to have included the AM provision).

What we are seeking is nothing more than a level playing field for AM. AM radio stations should be free to program to meet the perceived needs and desires of their potential audiences, without being restricted to broadcasting primarily talk and nostalgia programs which have some hope of getting through the radio relatively undamaged. AM stations which do broadcast music now know that, if their offerings become at all popular, their audience can be quickly stolen away by a competing FM station because music sounds so much better there. Radio listeners would be able to freely choose among competing broadcast products, without being unsubtly guided away from the AM dial by the terrible sound.

Comparison of the AM Stereo Systems

Both the Motorola C-Quam and Kahn ISB AM Stereo systems have problems. Neither system is linear, so both systems can produce unwanted out-of-band modulation products. Neither system is optimal.

The Motorola system has had far more attention paid to receiver implementation. That doesn't mean it is better, only that more receiver chips exist, at least in this country, for this system. The marketplace has not been able to technically evaluate the competing AM Stereo systems. When the Harris system was ordered off the air by the FCC effective September 1, 1983, it was the leading system with the most stations transmitting it. Although allowed back on the air within the month, it never recovered its momentum. Multi-system stereo decoder chips useful for the Kahn system were withdrawn from the

marketplace by at least one manufacturer. Quality stereo receivers were sold in Canada, but not in the United States.

If an AM stereo system is to be chosen without concern for future development, based only on a popularity contest, then C-Quam is the clear winner. However, the marketplace has not been given the opportunity to select an AM Stereo system on technical grounds. If there is any true concern for picking the best AM Stereo system, one which will permit AM radio to continue to develop for the future and which will assure that AM is not unnecessarily locked out of future competition, then it is possible that the answer may be neither of the above, but perhaps even something less complex.

Appendix 1 to this statement was prepared by Alfred E. Resnick, P.E., Vice President and Director of Engineering, Radio Division, Capital Cities/ABC. It is included here rather than signed separately since he was required to be away from the office during the preparation of these Comments, and his text was transmitted to me electronically.

DATED: April 2, 1993

Kenneth J. Brown

EXHIBIT 1

cpy: Braun
Resnick
Lindberg

NEWS

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July 27, 1990

FCC NATIONWIDE AUDIT OF AM STATIONS FOR INTERFERENCE REDUCTION FINDS THE MAJORITY OF STATIONS ARE IN COMPLIANCE WITH NEW FCC REQUIREMENTS

On July 10, 1990, the FCC's Field Operation Bureau conducted a nationwide audit of 374 AM stations and found a high level of compliance with new emission limitation requirements to reduce adjacent channel interference to AM stations.

On April 12, 1989, the Commission amended its rules to specify a new emission standard, which was functionally identical to an emisson standard recommended by the National Radio Systems Committee (NRSC), for AM broadcast stations. The NRSC standard attenuates AM sideband energy beyond 10 kHz of the assigned carrier frequency, thereby reducing levels of adjacent channel interference. The FCC considers this interference reduction an important part of its ongoing AM improvement effort.

Under the new rules, an AM station could be in compliance by either using special NRSC equipped audio processing equipment or a special NRSC audio filter for emissions within a specified bandwidth. The Field Operations Bureau found that of the 374 AM stations inspected, 325 (87 percent) complied with the equipment installed alternative. On July 12, 1990, technical measurements were conducted of the remaining 49 stations and they were found to be in compliance with the AM emission limits.

The Commission issued a Public Notice on May 11, 1990, reminding all AM

Appendix 1

Technical Comments Prepared in Connection with

Comments of Capital Cities/ABC, Inc.
In the matter of
NPRM ET 92-298

These comments are based on experience with AM stereo in the last decade. From the listener's perspective, AM stereo is a failure, whether judged by the percentage of AM radios which can receive AM stereo, or the number of stations converted to transmit AM stereo (about 600 out of almost 5000 AM stations). AM stereo conversions in foreign countries where a single system has been chosen have not been successful except possibly in Japan, where a large promotional campaign is underway. Promotion notwithstanding, the Japanese listeners have not found AM stereo to be the sole answer to the problems that AM broadcasting faces.

The system proposed in the present Notice has been well marketed and promoted in this country. This system's proponent once said that the choice of an AM stereo system was not a technical decision, but a marketing decision.

The competition for listeners that AM radio faces is not only FM, but CD and high quality cassette. The time has come to choose an AM stereo system on technical merits

be no distortion generated. The linear system does not produce distortion in its sum or difference channel as a consequence of a sum channel or difference channel modulation process.

Comparing the two systems, the non-linear system requires a more complicated decoder because it uses more parts (or requires more blocks in a block diagram) than the equivalent linear system.

Gain changes affect the envelope and angle demodulator in a non-linear demodulator differently. Because of this, a gain change is needed in the difference channel of the demodulator to maintain the correct (L+R) and (L-R) levels.

The Commission itself performed these tests, did the analysis, and drew the proper conclusions in Docket 21313. See Appendix E of Report and Order FCC 82-111, adopted March 4, 1982.

AM stereo proponents are attracted to certain technologies, usually a technology where the proponent holds patents which are specifically related to the system(s) under consideration. This may be the reason that a linear independent sideband system has not been advanced - no single proponent holds enough patents for components of a linear independent sideband AM stereo system. Ten years ago, the phase shift network, which is required in a linear independent sideband system, was a not-too-easy circuit to construct, especially when high performance is expected. Today, the phase shift network can be constructed economically with low-noise, high-speed opamps, and the possibility of some type of Digital Signal Processing (DSP) to provide the phase shift network for an advanced receiver is practical enough to receive serious consideration. (For an example of a receiver application, see Campbell's April 1993 QST Magazine article.)

The fact remains that an additional phase shift network or DSP has a cost, but DSP will be common in the next generation of receivers which will introduce AM radio's newest competitor, Digital Audio Broadcasting or Digital Audio Radio.

Although AM signals are generated at high power levels by non-linear methods for reasons of transmitter efficiency, monophonic AM is a linear system. The signal is best understood as a linear summation of terms.

Two equations are shown below. These equations describe an AM stereo signal in the time domain. The first is a linear sum of in-phase and quadrature terms, similar in form to equation (2) in Appendix E of the Report and Order, FCC 82-111, adopted March 4, 1982 in the AM stereo docket 21313. The second is in the form of a magnitude term and an angle term, similar in form to the composite carrier equation shown in Appendix B, in the proposed text for Section 73.128(c)(8) in the Notice. It is similar to equation (1) in the AM stereo Report and Order in Docket 21313.

$$E_c = A_c\Big[\Big[1+m\sum_{n=1}^{\infty} C_{sn}\mathrm{Cos}(\omega_{sn}(t)+\varnothing_{sn})\Big]\mathrm{Cos}\ \omega_c t$$

$$+\Big[m\sum_{n=1}^{\infty} C_{dn}\mathrm{Cos}(\omega_{dn}(t)+\varnothing_{dn})\Big]\mathrm{Cos}(\omega_c(t)+\pi/2+0.05\ \mathrm{Sin}\ 50\pi t\Big]$$

(A sum of terms)

Or

$$E_c = A_c\Big[1+m\sum_{n=1}^{\infty} C_{sn}\mathrm{Cos}(\omega_{sn}(t)+\varnothing_{sn})+j\,m\sum_{n=1}^{\infty} C_{dn}\mathrm{Cos}(\omega_{dn}(t)+\varnothing_{dn})\Big]$$

$$\mathrm{Cos}\Big[\omega_c t+\mathrm{Tan}^{-1}\Big[\frac{m\sum_{n=1}^{\infty} C_{dn}\mathrm{Cos}(\omega_{dn}(t)+\varnothing_{dn})+0.05\ \mathrm{Sin}\ 50\pi t}{1+m\sum_{n=1}^{\infty} C_{sn}\mathrm{Cos}(\omega_{sn}(t)+\varnothing_{sn})}\Big]\Big]$$

(A product of terms)

In the first equation, the first term alone is mono AM. An analysis of the signals represented by the equations above will show that no high-order sidebands are created as a result of the modulation process. Consequently, a linear AM stereo system cannot produce out of band emissions when provided with a band-limited modulating signal. If the Commission is to remain true to its efforts to minimize out of band emissions, the linear AM stereo signal must remain as an authorized emission.

When detected by a synchronous detector, no intermodulation of the recovered audio is caused when the bandwidth of the receiver is necessarily reduced during poor receptionconditions. There is no increase in distortion from selective fades. There is no increase in distortion in areas of carrier nulls caused by local reradiating objects, or deep nulls

The benefits of a linear AM stereo system far outweigh its shortcomings. These were itemized in Appendix E of the Report and Order in Docket 21313:

A linear AM stereo system is most compatible with synchronous detectors;

A linear AM stereo system is fully compatible with mono receivers with synchronous detectors;

A linear AM stereo system permits the use of identical detectors in the sum (L+R) and difference (L-R) channels;

A linear AM stereo system contains excellent potential for future technological growth.

The Commission spent considerable effort to obtain the data contained in Appendix E of the AM Stereo Report and Order. The technical basis supporting the facts and opinions contained in that Appendix have not and will not change with time. Appendix E from Docket 21313 is still good reading and necessary reading for anyone contemplating specifications for an AM stereo system.

No one can argue with the fact that AM radio needs help. Help in the form of better fidelity and in the form of extended frequency response and less distortion is extremely important to AM radio today. AM radio also needs any and all promises of future technological improvement. Only a linear AM stereo system can offer these advantages to AM radio.

Alfred E. Resnick, P. E
April 2, 1993